(comprising bending force sensors) is cost effective, the sensor system **50** may be included with many devices associated with limbs, for instance prosthetic feet. The sensor system **50** may remain permanently attached to a prosthetic foot. The sensor system **50** might be connected to a processing device when the prosthetic foot is first fitted to its user and thereafter during successive visits to, for instance, a trained prosthetist.

[0099] **FIG. 7** illustrates an intelligent prosthetic foot with a built-in component for processing and displaying the data gathered from the bending sensors. In contrast to the embodiment illustrated in **FIG. 6**, the embodiment illustrated in **FIG. 7** comprises a built-in processing unit **70**, which might include a processor (not illustrated) for processing the sensed data, a battery (not illustrated) for operating the built-in processing unit **70**, and a user interface **72** comprising three LED lights. These lights might be configured so as to indicate when the prosthetic foot is experiencing, respectively, a heel strike, a toe load, or a neutral position in between. Additionally, the lights may indicate when heel strike or toe load values are inside or outside of a predetermined or a desired range or exceed a threshold value. A trained prosthetist might observe the lights while, for instance, aligning the prosthetic foot for its user. Such alignment might occur while the user is, for example, standing, sitting, walking, or running, thereby providing for either static or dynamic alignment.

[0100] Additionally or alternatively, the built-in processing unit **70** might comprise a sophisticated digital signal processor, capable of indicating that, for instance, gait it not optimal. In this instance, the lights on the user interface **72** might indicate certain non-optimal performance characteristics. In some embodiments, the built-in processing unit **70** might be configured to determine other conditions related to, for instance, a user's safety, usage statistics, selection of device, or internal failure of the device. For instance, the processor might be programmed to detect if a prosthetic foot is too stiff. This condition may be detected if the sensor system never detects a certain amount of bending beyond a predetermined or desired threshold (e.g., a desired threshold previously defined by fixed values or algorithms). Other detected safety conditions might include an increase in weight of the user, a predominant favoring of one side of the prosthetic foot, or irregularities in detecting alternating heel strikes and/or toe loads. An example of the kind of internal failure that might be detected is the delamination of the carbon fibers of, for example, a prosthetic foot. The built-in processing unit might detect that the device is bending too much, for instance, by sensing that a predetermined threshold has been exceeded. Too much bending may be indicative of delamination of the carbon fibers, which may lead to the toe breaking off if left unattended. The user interface **72** might be programmed to signal delamination, as well as other detected safety and/or internal failure conditions. The built-in processing unit **70** might also be configured for vibration analysis corresponding to changes in frequency and/or resonation.

[0101] In some embodiments, the built-in processing unit **70** comprises random access memory (RAM) embedded in the processor. This memory may be used during the real-time processing of the sensed data. Additionally or alternatively, the built-in processing unit **70** may comprise long-term memory, such as flash memory, for storing accumulated data, such as the number of steps, force, load, or bending measurements, including step-by-step measurements. This stored data may be used to calculate an activity index such as described above. In these embodiments, the processor would be able to provide feedback based on the history of gait dynamics detected by the sensor system **50**. Threshold values might be stored in the long-term memory or embedded in the control logic of the processor.

[0102] **FIG. 8** illustrates an intelligent prosthetic foot with detachable component for processing data gathered from the bending sensors. In this embodiment, the sensor system **50** is linked to a detachable processing unit **80** through a snap-on connector **82**. The detachable processing unit might perform all of the functions attributed to the built-in processing unit, described above with reference to **FIG. 7**. Additionally, the detachable unit **82** may be configured to interact with another computing/peripheral device through the alternative connector **84**. The other computing/peripheral device might provide additional processing or might provide a user interface. In some embodiments, the detachable processing unit **80** may comprise primarily a memory for storing the sensed data, which is processed by another device either through the alternative connector **84** or some other connection (not illustrated).

[0103] **FIG. 9** illustrates an intelligent prosthetic foot with a wireless unit for communicating data gathered from the bending sensors. In this embodiment, the sensor system **50** communicates the sensed data to a remote processing unit (not illustrated) via a wireless transmitter **90**.

[0104] As discussed with reference to **FIG. 6** or to **FIG. 8**, in some embodiments, the intelligent foot might be connected to another computing/peripheral device for processing and/or user interface functionality. **FIG. 10** illustrates an intelligent foot with a snap-on connector for connecting to other computing/peripheral devices. In contrast to the embodiment illustrated in **FIG. 8**, the embodiment illustrated in **FIG. 10** does not have a local processing unit, but communicates all data to a separate computing/peripheral device. With reference to **FIG. 10**, the sensor system **50** is connected through a snap-on connector **82** to a dedicated computing device **120**, which might also be a personal digital assistant (PDA). **FIGS. 11 through 14** illustrate possible computing/peripheral devices, including, respectively, a wristwatch **110** (**FIG. 11**), a dedicated computing device **120** (**FIG. 12**), a laptop **130** (**FIG. 13**), and a set of headphones **140** (**FIG. 14**). One skilled in the art will appreciate that there are many computing/peripheral devices that may be adapted to provide supplementary or complementary processing and/or interface functionality, which should be considered as contemplated by and included in the embodiments described above.

[0105] As illustrated in **FIG. 14**, a user of an intelligent device may configure the device to transmit sound signals received by a user's headphones or earphones. These sound signals might help the user to associate certain sounds with the detected performance characteristic perceived by a sensor system. In one embodiment, the performance characteristic is the bending of a resistive strip, which may indicate, alternatively, a heel strike state and a toe load state of a prosthetic foot. The intelligent device may be configured to give sound signals for these alternating events during the movement of the device. For example, the user of the